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DEVELOPMENT STRATEGY AND GOVERNANCE DIVISION

January 2006

DSGD Discussion Paper No. 27

## Determinants to Change in House-hold Level Consumption and Poverty in Uganda, 1992/93-1999/00

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## **ACKNOWLEDGEMENTS**

USAID-Uganda Mission provided financial support for this study, through the Strategic Criteria for Rural Investments in Productivity (SCRIP) Program, which is implemented by the International Food Policy Research Institute. See [www.foodnet.cgiar.org/SCRIP](http://www.foodnet.cgiar.org/SCRIP) for details on SCRIP. All errors are responsibility of the authors. Kindly send comments to [s.benin@cgiar.org](mailto:s.benin@cgiar.org).



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## **ABSTRACT**

Recent estimates showing increase in the incidence of poverty in Uganda has kindled interest in understanding the factors that cause changes in poverty, as the reversal of the positive trend in the 1990s threatens the government's poverty eradication plan of reducing poverty to a level below 28% by 2014. Using a household and community panel dataset, this paper analyzes the factors contributing to change in household-level consumption and poverty. On average, per capita real consumption increased by about 49% from 1992/93 to 1999/00 (or 6.5% per annum). The population of households living below the poverty line declined from 58% in 1992/93 to 32% in 1999/00. Of those who were poor in 1992/93, about 66% of them escaped poverty and, of those who not poor in 1992/93, 26% of them went into poverty.

Results from econometric analyses suggest that adopting policies and strategies that reduce the pressure on agricultural land, creates employment opportunities, and improves access to farmland will be key interventions for raising real per capita consumption and reducing poverty across the country.

However, the results also show that the impact of several factors are not the same across the country, suggesting that different interventions for raising consumption will also be needed for different parts of the country. For example, improving access to and quality of infrastructure will be important in rural central and eastern regions while improving support to livestock husbandry will be important in the rural western region. In the urban areas, improving drought management techniques of those engaged in agriculture will be very important; rainfed agriculture was the main economic activity for about 40% of urban dwellers. In the rural eastern region, characterized by rapid population growth (3.62% per annum), in addition to the already very dense population (226 persons per square kilometer), reducing the pressure on agricultural land and

creating employment opportunities will be crucial in reversing the recent increase in poverty. With the insecurity problem in northern Uganda, it is unlikely for investment in infrastructure or provision of public services to prompt or support growth in any significant manner in the region, given that there is a threshold effect of security on growth.



# **Determinants of Change in Household-Level Consumption and Poverty in Uganda, 1992/93-1999/00**

**Sam Benin and Samuel Mugarura<sup>1</sup>**

## **I. INTRODUCTION**

Uganda has been undergoing a major transformation since the late 1980s towards economic growth and poverty reduction. In the 1990s, gross domestic product (GDP) grew steadily by more than 6% per annum (p.a.) from a low rate of 3% in the 1980s (MFPED 2004a), and proportion of the population living under the poverty line declined from 56% in 1993 to 35% in 2000 (Appleton 2001). This remarkable turnaround from the doldrums associated with the political turmoil and economic mismanagement of the 1970's until the mid-1980s has been achieved through sound policies linked to investments and economic liberalization undertaken by the Government of Uganda with support from several development partners. Despite the substantial progress made, including major developments in social services, several challenges remain in sustaining the momentum by way of reducing poverty, as there is indication that growth in the last five years has not been pro poor. The incidence of poverty increased on average from 35% in 1999/00 to 38% in 2002/03, with the largest increment occurring in the Eastern Region (Appleton and Ssewanyana 2003). This threatens the Government of Uganda's Poverty Eradication Action Plan (PEAP) of reducing poverty to a level below 28% by 2014 (MFPED 2004a), and has rekindled interest in understanding the causal factors of changes in poverty (MFPED 2004b).

Using a panel data set from the 1992/93 Uganda National Integrated Household Survey (UNIHS) and the 1999/00 Uganda National Household Survey (UNHS), this paper analyzes the factors contributing to change in household-level poverty in Uganda between those two periods.

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The literature on the determinants of household poverty is fairly well established, and it shows that various household and community level factors as well as regional and rural-urban differences in the location of households are important determining factors of poverty, suggesting that changes in those factors over time will cause poverty to change. Not surprisingly, several studies (e.g. Simler et al. 2004; Ssewanyana and Younger 2004; Bahiigwa and Younger 2005) have moved on to simulate poverty reduction interventions and estimated the associated change in poverty levels using the estimated determinants of poverty. Few studies (e.g. Deininger and Okidi 2004; Lawson et al. 2004), however, have attempted to directly examine the impact of change in the determinants on poverty reduction, a knowledge gap that is primarily due to lack of adequate household panel data sets. In those few studies too, the explanatory variables used to explain change in poverty have included a mixture of initial conditions and time-varying as well as fixed factors. The former two sets of factors often tend to be highly correlated. Thus, using both in the same regression can result in multicollinearity problems, potentially affecting the precision of the estimates. Furthermore, interpretation of the coefficients associated with the fixed factors such as regional location can be problematic. In this paper, we use a first-difference regression model and include only time-varying factors as explanatory variables of change in poverty. The first-difference model also eliminates unobservable fixed factors as a source of omitted variable bias (Deaton 1997).<sup>2</sup> We estimate the model separately for different regions.

The rest of the paper is organized as follows. The conceptual framework and hypotheses for examining the determinants of change in poverty are presented next. In Section 3, the econometric approach and data used are presented, followed by results and discussion in Section 4. Concluding remarks and implications are presented in Section 5.

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<sup>2</sup> Since many important changes take time to occur and programs and policies take time to have effect, the difference model may not be useful for short-time panels, and factors that have changed little over time are not likely to be statistically significant in the regression.

## II. CONCEPTUAL FRAMEWORK AND HYPOTHESES

First, we draw from the literature on the determinants of poverty, which is fairly well established and commonly modeled following two main approaches of measuring poverty: (a) per capita or adult equivalent consumption expenditure or (b) the Foster-Greer Thorbecke poverty indices, which are discrete functions of the household's consumption level vis-à-vis some poverty line.<sup>3</sup> The factors identified in the literature to determine poverty include: demography or human capital (including household size, age and gender composition, education, and health); financial and social capital (credit, employment, membership in mutual support organizations); physical capital (ownership of livestock and other productive assets); community factors (access to infrastructure and services, population density, urban-rural or regional location); and external factors (civil strife, climate). The underlying argument is that the above factors affect productivity and incomes, which in turn affect consumption and, therefore, poverty.

Logically therefore, we would expect that, other factors remaining the same, change in any of the above factors will cause change in poverty. In what follows, we develop testable hypotheses by examining how changes in the above factors may affect change in consumption and poverty, either directly or via changes in agricultural productivity and incomes.

### *Hypotheses*

Change in human capital. Given the common finding that larger households tend to be poorer (e.g. Lanjouw and Ravallion 1995; Deaton and Paxson 1998), we expect an increase in the size of the household to be associated with an increase in poverty. Larger households tend to have more dependents (young and aged), who are associated with lower productivity and incomes (Deininger and Okidi 2001; Nkonya et al. 2004). Thus, we expect an increase in dependents to be also associated with an increase in poverty.

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<sup>3</sup> Note that non-consumption measures of poverty including infant mortality, child height and others are also important and have been used (see e.g. Pradhan et al. 2003; Ssewanyana and Younger 2004; Bahiigwa and Younger 2005).

The impact of gender on poverty is indirect through the effects of differential access to extension, credit, education and productive inputs and participation in labor markets, as females are typically discriminated against these (Quisumbing et al. 1998), leading to lower agricultural productivity and agricultural incomes (Deininger and Okidi 2001). Thus, we would expect for example an increase in the composition of females within the household, all other factors remaining unchanged, to be associated with an increase in poverty. However, since females may have higher non-farm (trading) incomes (Nkonya et al. 2004), an increase in the composition of females may cause total household income to increase. Thus, the impact of change in gender composition on change in poverty is ambiguous a priori.

An increase in education is expected to reduce poverty. The derived evidence on this relationship is very substantial, and shown by the positive impact of education on agricultural productivity (Fan et al 2004; Nkonya et al 2004) and earnings and incomes (Deininger and Okidi 2001; Schultz 1988). In general, an increase in education is expected to increase the stock of human capital, and in turn labor productivity and wages. By reducing productivity and ability to participate in labor markets, an increase in health problems (HIV/AIDS) and other debilitating illnesses (e.g. malaria) is expected to increase poverty (Fan et al. 2004; Zhang 2004).

Change in financial and social capital. An increase in financial capital (e.g. through increase in access to credit or participation in labor markets) is expected to directly contribute to an increase in incomes and consumption and reduction in poverty. It can also contribute indirectly through increase in ability of households to acquire purchased inputs needed for increasing agricultural productivity and incomes (Benin and Pender 2001; Nkonya et al. 2004). The argument for the impact of change in social capital is similar, contributing directly to increase in consumption through mutual support in times of need or indirectly through sharing of information, networks and inputs that improve productivity.

Change in physical capital. Similar to financial capital, an increase in physical capital (productive assets such as farmland, livestock and equipment) is expected to contribute to increase in consumption and poverty reduction through an increase in agricultural productivity and incomes.

Change in community factors. The importance of location in poverty analysis has long been realized. For example, it is well known that poverty is higher in rural areas than in urban areas. However, such spatial information capture important factors related to policy, programs, infrastructure and institutions. Often, these factors (mostly of public good nature) are biased against rural areas compared to urban areas or they are better developed in some regions than others. Since these factors affect the preconditions for development, changes in them, rather than the physical location of households per se (which rarely change within the short to medium term period), are expected to change the wellbeing of households. For example, improvement in roads and access to markets is expected to reduce prices of purchased inputs as well as increase access to those inputs and, thus, raise the productivity and incomes of farmers. By reducing transactions costs, improvement in roads and access to markets can also increase farm gate prices and reduce consumer prices, which will improve the well-being of both producers and consumers.

Change in external factors. The impact of factors such as civil strife and environmental hazards such as droughts and floods on productivity, incomes and consumption have also been documented (see e.g. Deininger and Okidi 2001; Zhang 2004), and so we expect change in the incidence of these and related factors to cause change in the wellbeing of households.

### III. EMPIRICAL APPROACH

#### *Data Sources*

We use a panel data set obtained from the 1992/93 Uganda National Integrated Household Survey (UNIHS) and the 1999/00 Uganda National Household Survey (UNHS). The UNIHS covered the period March 1992 to March 1993 while the UNHS covered the period August 1999 to July 2000. These surveys covered all districts of the country except a few parishes in the districts of Moroto, Kotido, Kabale, Kisoro and Kasese in the UNIHS and the districts of Kitgum, Gulu, Kasese and Bundibugyo in the UNHS, both due to insecurity reasons. The UNIHS covered 9921 households while the UNHS covered about 10700 households. There were more than 1000 panel households (i.e. surveyed in both years).<sup>4</sup> Both surveys comprised of socio-economic (household level), agriculture (farm level), and community components. Information collected includes characteristics of households (size and age and gender composition), education, health, employment, expenditure and income, loans and credit, and access to services and infrastructure. For further details on the respective surveys and data, see GOU (1993) and UBOS (2001).

#### *Econometric Model and Estimation*

The econometric approach for analyzing the determinants of change in poverty is given by the following first difference model:<sup>5</sup>

$$Y_{it} - Y_{it-1} = \alpha + \beta(X_{it} - X_{it-1}) + e_{it} - e_{it-1} \quad (1)$$

$$\Delta Y_i = \alpha + \beta \Delta X_i + \varepsilon_i \quad (2)$$

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<sup>4</sup> Besides missing observations for comparable relevant variables in both surveys, there were also some problems with matching households in the two surveys. That is, there were some households in one survey that mapped to more than one household in the other survey, suggesting split up or merging of households. However, there was no information to ascertain whether this was indeed the case or due to errors in the coding of households. Observations on the above inconsistencies were deleted, leaving 940 for the analysis.

<sup>5</sup> In general, the first difference model eliminates unobservable fixed factors as a source of omitted variable bias (Deaton 1997).

Where  $\Delta Y_i (= Y_{it} - Y_{it-1})$  represents the change in poverty of household  $i$ ,  $\Delta X_i (= X_{it} - X_{it-1})$  the vector of change in observed time-varying factors affecting change in poverty,  $\varepsilon_i (= e_{it} - e_{it-1})$  is change in time-varying unobservable factors, and  $\alpha$  and  $\beta$  are the vectors of parameters to be estimated.

### Dependent Variables

The dependent variables used here are change between 1992/93 and 1999/00 in (a) per capita real monthly consumption expenditure and (b) head-count poverty index. The arguments for using expenditure rather than an income-based measure, or per capita consumption rather than per adult equivalent consumption, or a continuous function rather than an index (e.g. headcount index) are fairly well established and, thus, not repeated here (see Simler et al. (2004) and Benson et al. (2004) for discussion).

In estimating per capita real consumption expenditure, we follow Appleton (2001) and make three adjustments to the data. First, we adjust the 1992/93 consumption upwards to account for omission of an item code for transportation in that survey using the average share of transportation in 1999/00 (about 2.1%) as the adjustment factor. Second, we account for regional differences in food prices using the regional food price index calculated by Appleton (2001). Third, we deflate consumption estimates by the national consumer price index, as reported in Appleton (2001), using 1992/93 as the base year. Our calculations show that, on average, per capita real monthly consumption increased by about 49% from US\$ 10,966 in 1992/93 to US\$ 16,342 in 1999/00,<sup>6</sup> representing a real consumption growth rate of about 6.5% per annum.<sup>7</sup> Not surprisingly, households in the urban areas had the largest per capita real consumption expenditure, which doubled between 1992/93 and 1999/00, followed by households in the rural central, western and eastern regions. Growth in per capita real consumption expenditure was virtually zero among households in the northern region.

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<sup>6</sup> The foreign exchange rate was about US\$ 1 to US\$ (Ugandan Shillings) 1227 in 1992/93 (UBOS 1999).

<sup>7</sup> As in Appleton (2001), we use 7.5 years as the difference in time period between the two surveys.

Overall, our estimates compare favorably with those of Appleton (2001), who shows that per capita real (in 1992/93 value terms) monthly consumption in the household panel data set increased by 48.8% from USh 10,279 in 1992/93 to USh 15,295 in 1999/00. This also represents a real consumption growth rate of about 6.5% per annum. In reviewing other studies that have used the same panel data set, however, we noticed differences in the consumption estimates derived, which are likely due to differences in the type of adjustments made to the data.

Regional poverty lines provided by UBOS with the data sets were used to establish the head-count poverty index (P0) for each household. On average the population of households below the poverty line declined from 58% in 1992/93 to 32% in 1999/00. About 20% of the households were “chronically poor” (i.e. poor in both 1992/93 and 1999/00), while 31% were “never poor” (i.e. not poor in both periods). About 38% “moved out of poverty” (i.e. poor in 1992/93 but not poor in 1999/00) while the remaining 11% “moved into poverty” (i.e. not poor in 1992/93 but poor in 1999/00). Consistent with the regional variation in per capita real consumption expenditure, households in the northern region fared worst, with 61% of those who were poor in 1992/93 still being poor in 1999/00.

### Explanatory Variables

The explanatory variables used here are operational measurements of the factors discussed in the conceptual framework and represented by the vector  $\Delta X_i$ . Change in human capital is measured by change in household size, change in age, gender and education composition of household members, and change in number of extension visits received. We also include the number of times any member was ill for more than one month between the two survey periods to represent change in the health condition of household members. Change in financial capital is measured by change in the proportion of members employed and change in the proportion employed in the non-agricultural sector vis-à-vis the agricultural sector. Change in physical capital is measured by change in size of farmland operated and changes in value of livestock and farm equipment.



Change in social capital is measured by change in an index of ethnic heterogeneity in the community.<sup>8</sup> Change in other community factors includes change in population density and change in access to economic infrastructure measured by change in the sum of five binary variables representing the nearest tarred road, murram road, bank, post office, or telephone booth within one hour access.<sup>9</sup> Finally, change in external factors is captured by number of years between the two survey periods that there was an incidence of drought, given that rainfed agriculture is the main economic activity of households.

Following Simler et al. (2004) and many others, we did not include change in value of durable goods or dwelling characteristics in the set of explanatory variables because the imputed use value of these are included in the consumption expenditure of the household. In addition, variables such as change in current school attendance by members or change in production decisions (e.g. crop choice, use of purchased inputs, etc.) were excluded; with the former being an outcome rather than a determinant of current wellbeing and the latter due to obvious endogeneity reasons.

**Table 1** shows detail description of the dependent and explanatory variables and their summary statistics by region. Hypothesis test results show that majority of the changes that have occurred between 1992/93 and 1999/00 in each region, seemingly of small magnitudes, are significantly different from zero, and several of the changes are significantly different across regions. Post-primary education, however, has not changed significantly between the two survey periods, while access to infrastructure (murram/tarred road, bank, post office, or telephone booth) has not changed at all in the rural northern region. **Table 2** shows summary statistics of the variables by change in poverty status. Here too hypothesis test results show that majority of the changes that have occurred are significantly different from zero. Notably, changes in household size,

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<sup>8</sup> The index is a version of the Simpson index  $= (1 - \sum_k \delta^2) * 100$ , where  $\delta$  is the proportion of  $k$ th ethnic group in total population in the community. Larger values of the index represent greater heterogeneity.

<sup>9</sup> We used the composite measure since there was very little change in access to any one infrastructure. This has the potential of affecting the precision of our estimates. Also, there is the notion that the effects of these infrastructures are complementary.

**Table 1. Description of Variables and Summary Statistics by Urban and Rural Areas in Uganda<sup>1</sup>**

Variable description <sup>2</sup>	Total Sample	Urban Areas	Rural Areas			
			Central Region	Eastern Region	Northern Region	Western Region
<b>Household Monthly Consumption Expenditure</b>						
Per capita consumption in 1992/93 (USh) <sup>3</sup>	10965.87 <sup>RRR</sup>	15287.78	11497.66	9798.59	9705.32	11737.56
Per capita real consumption in 1999/00 (in 1992/93 USh) <sup>3</sup>	16341.96 <sup>RRR</sup>	29226.87	20571.47	13963.55	10028.62	17153.10
Change in per capita real consumption (in 1992/93 USh) <sup>3</sup>	5327.90 <sup>*** RRR</sup>	13939.09 <sup>***</sup>	8894.62 <sup>***</sup>	4164.96 <sup>***</sup>	323.30	5415.53 <sup>***</sup>
<b>Household Poverty</b>						
Proportion poor in 1992/93	0.58 <sup>RRR</sup>	0.44	0.45	0.63	0.72	0.59
Proportion poor in 1999/00	0.32 <sup>RRR</sup>	0.22	0.21	0.29	0.59	0.27
Change in poverty						
Moved out of poverty	0.38 <sup>RRR</sup>	0.29	0.33	0.47	0.28	0.40
Remained in poverty	0.20 <sup>RRR</sup>	0.14	0.11	0.16	0.44	0.19
Moved into poverty	0.11	0.08	0.11	0.12	0.15	0.09
Remained out of poverty	0.31 <sup>RRR</sup>	0.49	0.45	0.25	0.13	0.32
<b>Change in Household Level Characteristics</b>						
Change in gender of head (cf.: no change)						
Male to female	0.09 <sup>***</sup>	0.04 <sup>*</sup>	0.06 <sup>***</sup>	0.10 <sup>***</sup>	0.10 <sup>***</sup>	0.10 <sup>***</sup>
Female to male	0.03 <sup>*** RR</sup>	0.06	0.01	0.03 <sup>***</sup>	0.01	0.04 <sup>***</sup>
Change in age of head (years)	6.67 <sup>***</sup>	7.33 <sup>***</sup>	6.43 <sup>***</sup>	6.59 <sup>***</sup>	6.89 <sup>***</sup>	6.69 <sup>***</sup>
Change in proportion female members (%)	1.59 <sup>** RRR</sup>	-3.72	0.35	-1.40	6.32 <sup>***</sup>	2.91 <sup>**</sup>
Change in number of members	0.34 <sup>*** RR</sup>	-0.18	0.42	-0.19	0.51 <sup>*</sup>	0.68 <sup>***</sup>
Change in proportion of members aged (%):						
0 to 4 years old	-4.67 <sup>***</sup>	-6.04 <sup>***</sup>	-5.65 <sup>***</sup>	-1.89	-4.24 <sup>***</sup>	-6.32 <sup>***</sup>
5 to 10 years old	2.67 <sup>***</sup>	-1.25	2.56	2.80 <sup>*</sup>	2.69	3.13 <sup>**</sup>
11 to 17 years old	4.32 <sup>*** RR</sup>	5.85 <sup>*</sup>	4.69 <sup>***</sup>	0.26	2.91	8.04 <sup>***</sup>
65 years old and above	4.65 <sup>***</sup>	8.95 <sup>**</sup>	3.68 <sup>***</sup>	5.66 <sup>***</sup>	6.23 <sup>**</sup>	3.12 <sup>***</sup>
Change in proportion of members with (%):						
Primary education	8.83 <sup>***</sup>	8.81 <sup>**</sup>	6.55 <sup>***</sup>	7.95 <sup>***</sup>	12.36 <sup>***</sup>	9.26 <sup>***</sup>
Greater than primary education	0.63	2.13	1.26	0.71	-0.85	0.77
Change in number of extension visits received	0.06 <sup>**</sup>	0.05 <sup>*</sup>	0.10 <sup>***</sup>	0.10	-0.02	0.05
Number of members sick more than 1 month in 1992 to 2000	0.32 <sup>***</sup>	0.34 <sup>***</sup>	0.33 <sup>***</sup>	0.37 <sup>***</sup>	0.24 <sup>***</sup>	0.30 <sup>***</sup>
Change in proportion of members employed (%)	-2.40 <sup>**</sup>	-2.90	0.51	-3.18	-1.73	-4.36 <sup>**</sup>
Change in proportion employed in non-agriculture sector (%)	-3.36 <sup>*** RR</sup>	-0.92	-6.82 <sup>***</sup>	-3.21 <sup>*</sup>	2.23	-4.37 <sup>**</sup>
Change amount of agricultural land operated (ha)	0.35 <sup>***</sup>	0.20 <sup>**</sup>	0.33 <sup>***</sup>	0.17 <sup>***</sup>	0.16	0.64 <sup>***</sup>

**Table 1. Description of Variables and Summary Statistics by Urban and Rural Areas in Uganda<sup>1</sup> (Contd.)**

Variable description <sup>2</sup>	Total Sample	Urban Areas	Rural Areas			
			Central Region	Eastern Region	Northern Region	Western Region
Change in real value of livestock owned (in 1992/93 '000 USh) <sup>3,4</sup>	44.16 ***	42.43 ***	82.72 ***	37.32 ***	44.48 ***	20.03
Change in real value of agricultural equipment owned (in 1992/93 '000 USh) <sup>3,4</sup>	5.16 ***	87.01	4.75 *	2.05 ***	1.39 ***	2.84 ***
<b>Change in Community Level Characteristics</b>						
Change in index of ethnic heterogeneity (%) <sup>5</sup>	1.32 ***	1.74 **	2.02 ***	0.93 ***	0.80 ***	1.37 **
Change in access to economic infrastructure <sup>6</sup>	0.08 *** RRR	0.37 **	-0.01	0.22 **	0.00	0.05 **
Change in population density (persons per square kilometer) <sup>7</sup>	57.10 *** RRR	49.57 ***	56.10 ***	95.98 ***	45.51 ***	33.30 ***
Number of years of drought incidence between 1992 and 2000	0.99 *** RRR	0.71 ***	0.64 ***	0.97 ***	1.50 ***	1.02 ***
Number of observations	940	99	222	215	132	272

Notes:

<sup>1</sup> Means and standard errors are adjusted for weighting of sample; \*, \*\* and \*\*\* means change is statistically significantly different from zero at the 10%, 5% and 1% level, respectively; <sup>R</sup>, <sup>RR</sup> and <sup>RRR</sup> means changes are statistically significantly different across urban areas and rural regions at the 10%, 5% and 1% level, respectively.

<sup>2</sup> Unless otherwise stated change refers to the difference between the 1992/93 and 1999/00 values.

<sup>3</sup> US\$ 1=US\$ 1227 in 1992/93 (UBOS 1999).

<sup>4</sup> Regarding value of livestock and equipment, the 1992/93 levels were based on recall using the 1999/00 for comparison: much more, more, about equal, less, much less, and none. Following Deininger (2003), we assign the following respective percentage changes to calculate the change: -50%, -25%, 0%, 25%, 50%, and 100%.

<sup>5</sup> Heterogeneity of ethnicity is measured by a version of the Simpson index  $((1 - \sum_k \delta^2) * 100)$ ; where  $\delta$  is the proportion of  $k$ th ethnic group in total population in the community), with larger values of the index representing greater heterogeneity. Thus, change in heterogeneity is change in the index.

<sup>6</sup> Access to economic infrastructure is the sum of five binary variables representing presence of tarred road, murram road, bank, post office, or telephone booth within an hour's access.

<sup>7</sup> Population density is measured at the district level, as there was no information on the total area and population of the community (LC1 level) for the respective years.

Sources of data: 1992/93 Uganda National Integrated Household Survey (GOU 1993) and 1999/00 Uganda National Household Survey (UBOS 2001).

**Table 2. Description of Variables and Summary Statistics by Change in Household Poverty in Uganda<sup>1</sup>**

Variable description <sup>2</sup>	Total Sample	Change in Poverty			
		Moved out of Poverty	Remained in poverty	Moved into poverty	Remained out of poverty
<b>Household Monthly Consumption Expenditure</b>					
Per capita consumption in 1992/93 (USh) <sup>3</sup>	10965.87 <sup>RRR</sup>	6992.44	6496.54	16020.35	17018.71
Per capita real consumption in 1999/00 (in 1992/93 USh) <sup>3</sup>	16341.96 <sup>RRR</sup>	17244.27	7705.20	10346.65	23168.53
Change in per capita real consumption (in 1992/93 USh) <sup>3</sup>	5327.90 *** <sup>RRR</sup>	10126.96 ***	1208.66 ***	−5673.70 ***	6149.82 ***
<b>Change in Household Level Characteristics</b>					
Change in gender of head (cf.: no change)					
Male to female	0.09 ***	0.10 ***	0.07 ***	0.07 **	0.08 ***
Female to male	0.03 ***	0.04 ***	0.03 **	0.02 *	0.01 **
Change in age of head (years)	6.67 ***	6.11 ***	6.47 ***	7.56 ***	7.16 ***
Change in proportion female members (%)	1.59 **	1.87	1.57	0.38	1.70
Change in number of members	0.34 *** <sup>RRR</sup>	−0.26	0.14	1.60 ***	0.76 ***
Change in proportion of members aged (%):					
0 to 4 years old	−4.67 ***	−4.26 ***	−4.37	−5.51 ***	−5.09 ***
5 to 10 years old	2.67 *** <sup>RR</sup>	−0.44	2.83 *	6.50 **	5.03 ***
11 to 17 years old	4.32 *** <sup>RR</sup>	3.03 **	1.49	10.42 ***	5.63 ***
65 years old and above	4.65 ***	5.91 ***	3.28 **	2.93	4.65 ***
Change in proportion of members with (%):					
Primary education	8.83 *** <sup>R</sup>	8.12 ***	13.84 ***	9.41 **	6.11 ***
Greater than primary education	0.63	1.02	0.48	0.92	0.14
Change in number of extension visits received	0.06 **	0.33 ***	0.32 ***	0.31 ***	0.31 ***
Number of members sick more than 1 month in 1992 to 2000	0.32 ***	0.10 **	0.05	0.01	0.04
Change in proportion of members employed (%)	−2.40 **	0.32	−1.52	−6.71 *	−4.78 ***
Change in proportion employed in non-agriculture sector (%)	−3.36 *** <sup>R</sup>	−1.40	−1.40	−3.74	−6.94 ***
Change amount of agricultural land operated (ha)	0.35 ***	0.33 **	0.47 ***	0.22 ***	0.35 ***
Change in real value of livestock owned (in 1992/93 ‘000 USh) <sup>3,4</sup>	44.16 ***	39.50 ***	34.01 ***	36.50 ***	59.48 **
Change in real value of agricultural equipment owned (in 1992/93 ‘000 USh) <sup>3,4</sup>	5.16 ***	2.18 ***	6.72	2.47 ***	8.84 *
<b>Change in Community Level Characteristics</b>					

**Table 2. Description of Variables and Summary Statistics by Change in Household Poverty in Uganda<sup>1</sup> (Contd.)**

Variable description <sup>2</sup>	Total Sample	Change in Poverty			
		Moved out of Poverty	Remained in poverty	Moved into poverty	Remained out of poverty
Change in index of ethnic heterogeneity (%) <sup>5</sup>	1.32 ***	1.28 ***	1.39 **	2.05 ***	1.07 **
Change in access to economic infrastructure <sup>6</sup>	0.08 ***	0.11 **	0.04	0.05	0.08
Change in population density (persons per square kilometer) <sup>7</sup>	57.10 *** <sup>RR</sup>	57.23 ***	53.26 ***	70.14 ***	54.89 ***
Number of years of drought incidence between 1992 and 2000	0.99 ***	0.99 ***	1.11 ***	1.05 ***	0.89 ***
Number of observations	940	355	178	98	309

Notes:

<sup>1</sup> Means and standard errors are adjusted for weighting of sample; \*, \*\* and \*\*\* means change is statistically significantly different from zero at the 10%, 5% and 1% level, respectively; <sup>R</sup>, <sup>RR</sup> and <sup>RRR</sup> means changes are statistically significantly different across poverty groups at the 10%, 5% and 1% level, respectively.

<sup>2</sup> Unless otherwise stated change refers to the difference between the 1992/93 and 1999/00 values.

<sup>3</sup> US\$ 1≈US\$ 1227 in 1992/93 (UBOS 1999).

<sup>4</sup> Regarding value of livestock and equipment, the 1992/93 levels were based on recall using the 1999/00 for comparison: much more, more, about equal, less, much less, and none. Following Deininger (2003), we assign the following respective percentage changes to calculate the change: -50%, -25%, 0%, 25%, 50%, and 100%.

<sup>5</sup> Heterogeneity of ethnicity is measured by a version of the Simpson index  $((1-\sum_k \delta^2)*100)$ ; where  $\delta$  is the proportion of  $k$ th ethnic group in total population in the community), with larger values of the index representing greater heterogeneity. Thus, change in heterogeneity is change in the index.

<sup>6</sup> Access to economic infrastructure is the sum of five binary variables representing presence of tarred road, murram road, bank, post office, or telephone booth within an hour's access.

<sup>7</sup> Population density is measured at the district level, as there was no information on the total area and population of the community (LC1 level) for the respective years.

Sources of data: 1992/93 Uganda National Integrated Household Survey (GOU 1993) and 1999/00 Uganda National Household Survey (UBOS 2001).

dependents, primary education and non-agricultural employment were significantly different across the groups.

### Estimation and Estimation Issues

Change in per capita real monthly consumption: Ordinary least squares (OLS) procedures were used to estimate and test the impacts of the explanatory variables on the change in per capita real monthly consumption. The model was estimated separately for urban areas and for rural areas in each of the four administrative regions (central, eastern, northern and western).<sup>10</sup> Due to this regional disaggregation, we did not include a variable to account for civil strife, which was mainly concentrated in the northern region, as there was very little variation for a reliable estimation. An econometric problem to consider in this estimation is that several of the time-varying explanatory variables may be endogenous. For example, change in household size and age composition, change in health, change in financial capital, and change in physical capital may respond to or be affected by change in the level of consumption or poverty, suggesting that OLS estimates may be inconsistent if those explanatory variables are indeed endogenous. Then, an instrumental variables (IV) technique may be more appropriate. To decide which regression method to use, first, we estimated the models using both regression methods, i.e. OLS and IV, using the initial 1992/93 levels of those potentially endogenous explanatory variables as instruments in the IV model.<sup>11</sup> Then, we tested for potential endogeneity bias using a Hausman test (Hausman 1978; Greene 1993). We failed to reject exogeneity of those potentially endogenous explanatory variables in all the

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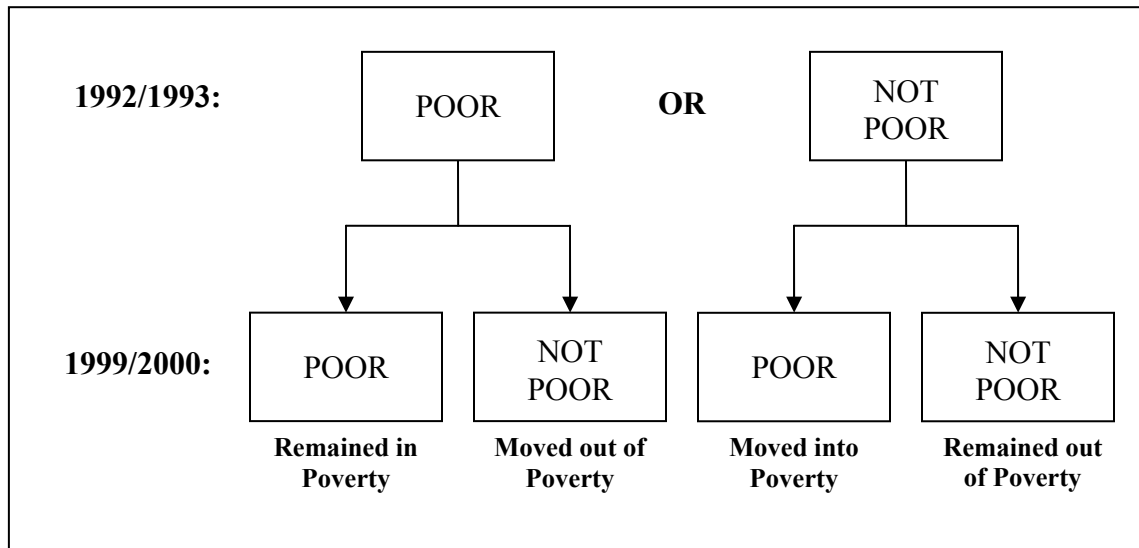
<sup>10</sup> The coefficients were tested for equality across equations to determine whether data for some regions should be pooled, but the chow test results were inconclusive and so we maintained separate equations. Detail results of the statistical tests are shown in Table 3.

<sup>11</sup> To properly estimate the model using IV, the instruments (at least one for each endogenous explanatory variable) used should be correlated with the endogenous explanatory variables being instrumented for but not correlated with the dependent variable. First, several of the relevant initial 1992/93 variables that were correlated with one or more of the potential endogenous explanatory variables were identified. Then, these in addition to the exogenous variables were used directly in the model using the OLS method. The instruments finally selected were those initial values that had insignificant statistical effect on change in consumption.

disaggregated models, except in the case of rural central region.<sup>12</sup> Thus, we report IV results in the case of rural central region and OLS results for the others. STATA software (StataCorp 2005) was used for the regression analysis.

Change in head-count poverty index: Regarding change in the head-count poverty index (see **Figure 1**), various limited dependent variable techniques have been used, with the most favored being the multinomial logit (Greene 1993), where the change in the poverty states are treated as independent outcomes (e.g. Deininger and Okidi 2004; Lawson et al. 2003). However, as **Figure 1** shows, if a household was poor in 1992/93, then the household can either get out of poverty or remain in it in 1999/00. Similarly, if a household was not poor in 1992/93, then the household can either become poor or remain out of it in 1999/00. Therefore, the outcome in 1999/00 depends on the state of poverty in 1992/93, suggesting that use of multinomial logit is restrictive. See Lawson et al. (2003) for further discussion.

**Figure 1. Change in Household Poverty Status**



<sup>12</sup> The Hausman test is given by the chi-square value,  $\chi^2 = (\hat{\beta}_{IV} - \hat{\beta}_{OLS}) (Var_{IV} - Var_{OLS})^{-1} (\hat{\beta}_{IV} - \hat{\beta}_{OLS})$  where  $\hat{\beta}$  and  $Var$  are the estimated coefficient and variance, respectively. Details of the test results are presented in Table 3.

In this paper, we use a sequential response modeling approach (Madalla 1983), where:

- a. The whole panel dataset is used to estimate the probability of the household being poor in 1992/93.
- b. The sub sample of households that were poor in 1992/93 is used to estimate the probability of the household being poor in 1999/00 (i.e. moved out of poverty vs. remained in poverty).
- c. The sub sample of households that were not poor in 1992/93 is used to estimate the probability of the household being poor in 1999/00 (i.e. moved into poverty vs. remained out of poverty).

Lawson et al. (2003) also used the sequential response approach to analyze poverty dynamics in Uganda. For efficiency reasons, however, we estimate the regressions simultaneously, i.e. we estimate a. and b. as well as a. and c. together (see Madalla 1983). We used the “svyheckprob” command in STATA for the regression analysis (StataCorp 2005). The initial 1992/93 values associated with the explanatory variables (see **Annex 1**) are used in estimating the probability of the household being poor in 1992/93. Besides explaining the factors contributing to the poverty status of the household in 1992/93 and change in those factors contributing to the household’s getting out of poverty or moving into poverty, the model estimates can be used to predict the poverty state of a household for a given set of initial values and change in those initial values.<sup>13</sup>

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<sup>13</sup> Figure 1 suggests that the conditional or nested logit (Madalla 19983; Greene 1993) could also be used here. The main drawback with this approach is that outcome-specific (poverty state) as well as individual-specific (household) characteristics are required. Also, the predictions associated with the model outputs are not relevant here. For example, given a new poverty outcome, the model outputs can be used to predict the probability that a household will fall into that category.



#### IV. RESULTS AND DISCUSSION

##### *Determinants of Change in Per Capita Real Monthly Consumption*

As **Table 3** shows, with the exception of changes in age of the household head, proportion of members with primary education, proportion of members employed in the non-agricultural sector, and value of equipment, all the other factors had a statistical significant effect in at least one of the regional equations, and the direction of their impacts conform to our expectations. However, it is clear that the factors contributing to change in per capita real consumption in Uganda between 1992/93 and 1999/00 are different for urban and rural areas.

The statistical insignificant impact of especially changes in education (except post-primary education in urban areas) and access to extension seem surprising, given the substantial empirical evidence of their impact on agricultural productivity and household incomes and especially in Uganda (see for example Deininger and Okidi 2001; Fan et al. 2004; Nkonya et al. 2005; Nkonya et al. 2004). However, our results suggest that the impacts of these factors in raising consumption are long-term.

Looking at education for example, **Table 1** shows that the increase in the proportion of household members that have completed primary education between the two survey years is very large, ranging from 7% in the rural central region to a little more than 12% in the rural northern region, suggesting that the Universal Primary Education (UPE) Policy, which allows for all children in the family to attend primary school (and no school fees are paid in the first four years), has had a substantial impact in improving primary education even in the short term. However, as **Table 1** also shows, change in the proportion of household members that have completed secondary or higher-level education between the two survey years is very low and statistically insignificant, less than 2% in the rural areas. We expect that the benefits of improvement in education in terms raising per capita real consumption will be realized when those primary

**Table 3. Ordinary Least Squares (OLS) Regression Results of the Determinants of Change Between 1992/93 and 1999/00 in Per Capita Real Consumption Expenditure in Uganda<sup>1</sup>**

Variable description <sup>2</sup>	Urban Areas	Rural Areas			
		Central Region <sup>4</sup>	Eastern Region	Northern Region	Western Region
<b>Change in Household Level Characteristics</b>					
Change in gender of head (cf.: no change)					
Male to female	-1827.03	2722.22	982.55	-4124.00 *	-3193.66
Female to male	6232.40	165.16	10176.37 *	1004.87	2287.88
Change in age of head (years)	846.28	101.10	-88.94	62.91	-35.10
Change in proportion female members (%)	187.31 *	-33.64	-5.66	59.56	2.42
Change in number of members	-89.87	-956.45 ***	-580.87 ***	-675.37 ***	-149.84
Change in proportion of members aged (%):					
0 to 4 years old	299.27	-210.72 ***	-71.39	-65.18	-109.23 *
5 to 10 years old	277.43	-212.95 ***	-41.54	-82.36	-89.24
11 to 17 years old	290.23	-113.46	-74.43 *	-63.31	-80.31
65 years old and above	-112.05	4.66	23.25	-59.46 *	119.49
Change in proportion of members with (%):					
Primary education	-9.73	9.32	10.12	58.62	-42.55
Greater than primary education	389.61 **	-28.65	-16.90	133.63	100.71
Change in number of extension visits received	-5681.97	-334.22	-1010.68	316.96	-282.26
Number of members sick more than 1 month in 1992 to 2000	-5633.23	187.65	876.52	-2743.54 *	-568.01
Change in proportion of members employed (%)	195.06 **	3.49	57.52 **	81.56	118.30 **
Change in proportion employed in non-agriculture sector (%)	-17.18	-10.46	33.89	-2.03	6.67
Change amount of agricultural land operated (ha)	5862.74 *	582.96 **	-55.91	617.30 **	484.53 *
Change in real value of livestock owned (in 1992/93 ‘000 USh)	12.38	3.60	-5.11	-1.78	7.76 **
Change in real value of agricultural equipment owned (in 1992/93 ‘000 USh)	1.24	50.36	-14.16	87.70	16.35
<b>Change in Community Level Characteristics</b>					
Change in index of ethnic heterogeneity (%)	-364.17	-56.93	174.47	-423.94 ***	11.13
Change in access to economic infrastructure	-1831.14	2727.14 ***	1316.75 **		-115.84
Change in population density (persons per square kilometer) <sup>7</sup>	117.02	117.56 ***	-55.52 **	-77.32	160.53 *
Number of years of drought incidence between 1992 and 2000	-7989.87 ***	-922.08	-562.28	414.05	-401.61
Intercept	9791.64	-463.57	9432.60 ***	3930.26	1528.35
Number of observations	99	222	215	132	272

**Table 3. Ordinary Least Squares (OLS) Regression Results of the Determinants of Change Between 1992/93 and 1999/00 in Per Capita Real Consumption Expenditure in Uganda<sup>1</sup> (Contd.)**

Variable description <sup>2</sup>	Urban Areas	Rural Areas			
		Central Region <sup>4</sup>	Eastern Region	Northern Region	Western Region
F-statistic	2.57 ***	3.03 ***	4.81 ***	3.61 ***	4.07 ***
R-squared	0.25	0.32	0.37	0.35	0.27
Test of Endogeneity (Hausman Test) <sup>3</sup>	1.05	131.68 ***	11.95	27.78	0.63
Test of equality of coefficients across equations (Chow Test)					
Ho: Urban Areas=Rural Central Region=Rural Eastern Region=Rural Northern Region=Rural Western Region: F(23, 788)=5.85***					
Ho: Urban Areas=Rural Central Region: F(23, 249)=1.56*					
Ho: Urban Areas=Rural Eastern Region: F(23, 242)=3.42***					
Ho: Urban Areas=Rural Northern Region: F(23, 162)=1.46					
Ho: Urban Areas=Rural Western Region: F(23, 301)=1.27					
Ho: Rural Central Region=Rural Eastern Region: F(23, 381)=0.94					
Ho: Rural Central Region=Rural Northern Region: F(23, 301)=1.49					
Ho: Rural Central Region=Rural Western Region: F(23, 440)=0.32					
Ho: Rural Eastern Region=Rural Northern Region: F(23, 294)=1.91**					
Ho: Rural Eastern Region=Rural Western Region: F(23, 433)=1.27					
Ho: Rural Northern Region=Rural Western Region: F(23, 353)=1.63**					

Notes:

<sup>1</sup> Coefficients and underlying standard errors are adjusted for weighting of sample; \*, \*\* and \*\*\* means coefficient or test statistic is statistically significant at the 10%, 5% and 1% level, respectively.

<sup>2</sup> See Table 1 for notes on the explanatory variables.

<sup>3</sup> Test for endogeneity of changes in household size, gender and age composition, education, employment and ownership of land, livestock and equipment. Ho:  $\text{plim } \hat{\beta}_{IV} - \hat{\beta}_{OLS} = 0$  is tested with the chi-square statistic:  $W = (\hat{\beta}_{IV} - \hat{\beta}_{OLS}) (Var_{IV} - Var_{OLS})^{-1} (\hat{\beta}_{IV} - \hat{\beta}_{OLS}) \sim \chi^2(k)$ , where  $\hat{\beta}$  and  $Var$  are the estimated coefficient and variance, respectively, and  $k$  is the number of coefficients. The 1992 values of the suspected variables were used as instruments in the instrumental variables (IV) model. The chi-square values as reported were not statistically significant.

<sup>4</sup> IV model results, where initial (1992/93) values of explanatory variables are used as instruments for the endogenous explanatory variables. See note 3 above.

Sources of data: 1992/93 Uganda National Integrated Household Survey (GOU 1993) and 1999/00 Uganda National Household Survey (UBOS 2001).

school graduates have gone on to complete post-primary education to make them more competitive when they join the labor force. Regarding extension, the data shows that the average number of extension visits per year received by the household was less than one in both survey periods. Actually, data from the UNHS community survey shows that the proportion of communities that had no extension coverage in 1999/00 was about 60%, 55%, 62% and 79% in the central, eastern, western and northern regions, respectively. With the National Agricultural Advisory Services (NAADS) program coming into force in 2001 in 6 districts (Arua, Kabale, Kibaale, Mukono, Soroti and Tororo), it already seems that the situation is changing, as there is indication that the program is having positive impacts on agricultural productivity and household incomes (Benin et al. 2005; Nkonya et al. 2005). NAADS is now being implemented in 37 districts and is expected to cover the entire country by the financial year 2007/08.

#### In The Urban Areas

The results in **Table 3** show that changes in proportion of female members, proportion of members that have completed some post-primary education, proportion of members employed, size farmland, and incidence of drought were the significant causes of change in real per capita consumption expenditure in urban areas. An increase in the proportion of household members with greater than primary education or employed were associated with an increase in per capita real consumption between the two survey periods, highlighting the importance of education and employment in poverty reduction in urban areas. For example, other factors remaining unchanged, an increase in the number of people employed by one person (equivalent to about 30% increase in the proportion employed) was associated with about US\$ 5850 increase in real per capita consumption expenditure.

Increase in the incidence of drought had a severe negative impact on poverty and was associated with a decline in real per capita consumption expenditure by about US\$ 8000, which is nearly 50% of the average per capita consumption in 1992/93 in urban areas. It seems surprising that drought should have such a drastic effect in urban areas.

However, urban agriculture is very important and the data shows that about 40% and 36% of household members were primarily employed in the agricultural sector in 1992/93 and 1999/00, respectively. Furthermore, they were mostly engaged in horticultural, vegetable and high-value agricultural production that demands lots of water, making them more vulnerable to drought. Not surprisingly, and similar to the finding in rural areas, an increase in size of farmland was associated with an increase in real per capita consumption. Together, the results suggest that improving drought management techniques of urban dwellers engaged in agriculture will be very important in poverty eradication. Note that in 1999/00, the percent of urban communities that had access to extension was only 15%.

#### In The Rural Central Region

As **Table 3** also shows, increase in population pressure at the household level, and especially of the group aged 10 years and below, had a significant negative impact on change in real per capita consumption expenditure. On the contrary, increase in population pressure at the community level had a positive impact on change in real per capita consumption expenditure. Increase in size of farmland and improvement in access to infrastructure also contributed significantly to increase in real per capita consumption in the region. Although the panel dataset used here shows that on average there was no significant change in access to infrastructure between the two survey periods in the region (**Table 1**), access to infrastructure was already very high, suggesting that improvements in quality of infrastructure rather than access alone may have been the impetus for change.

Compared to the other rural areas, the rural central region experienced the fastest growth rate in real consumption expenditure (about 5.8% per annum) between 1992/93 and 1999/00. This is quite remarkable considering that it exhibited the lowest population growth rate (about 2.76% per annum) between the same periods (UBOS 2003).

### In The Rural Eastern Region

Increase in population pressure at the household and community levels were the significant causes of change in consumption, with one additional person at the household or community level being associated with a decline in real per capita consumption expenditure of about USh 580 and 56, respectively. These results seem to support the Malthusian perspective that rapid population growth is contributing to resource degradation, declining agricultural productivity, and increasing poverty in the rural eastern region. Actually, it is the only area where increase in size of farmland did not have a positive impact on change in real per capita consumption. It is not surprising that the recent estimates showing increase in poverty rates in Uganda between 1999/00 and 2002/03 was severest in the region (Appleton and Ssewanyana 2003). The eastern region in general has the highest population density (226 persons per square kilometer (UBOS (2003))). The panel data used here shows that real per capita consumption expenditure growth rate was about 4% per annum (from **Table 1**), which was barely greater than the population growth rate of 3.62% per annum (UBOS 2003). Therefore, easing the pressure on agricultural land by improving access to infrastructure and creating employment opportunities in general (non-farm employment in particular) will be important, as reflected by the positive impacts associated with related variables in the regression results.

Existing evidence of the impact of population pressure, however, is mixed, even in Uganda alone. For example, there is evidence that population pressure can have a positive impact on agricultural intensification (use of fertilizer and improved seeds and plowing in crop residues) (Nkonya et al. 2004; Pender et al. 2004a), value of agricultural production (Pender et al. 2004b), and tree planting (Otsuka and Place 2001). However, population pressure has been found also to be associated with extensification or increase in conversion of land to agriculture (Otsuka and Place 2001), increase in use of slash and burn and erosion (Nkonya et al. 2004), reduction in value of agricultural production (Pender et al. 2004b), and reduction in availability of forests and energy sources for cooking (Pender et al. 2004a).

### In The Rural Northern Region

Increase in population pressure at the household level and health problems were significant causes of reduction in real per capita consumption expenditure. One additional person being added to the household or being sick for more than a month was associated with a decline in real per capita consumption of about USh 675 and 2740, respectively. Actually, the rural northern region is the only area where illness had a significant negative impact on real per capita consumption, reflecting the lack of access to health services. It is also the only region analyzed here that access to infrastructure (tarred road, murram road, bank, post office, and telephone booth) had not changed between the two survey periods (**Table 1**), and so its impact on change in real per capita consumption could not be estimated. Zhang (2004) shows that there is a threshold effect of security and, consequently, investment in infrastructure and provision of public services on growth. Thus, with the insecurity problem in northern Uganda, it is unlikely for investment in infrastructure or public services to prompt or support growth in a significant manner. The negative impact associated with the heterogeneity index also reflects disruption by the insecurity of social institutions that support productive and consumptive activities.

Although the northern region in general is the fastest population-growing region in Uganda, with a population growth rate of 4.53% per annum, the population density is only 65 persons per square kilometer, about one-half of the national average (UBOS 2003) and a vast amount of farmland have been left uncultivated for nearly two decades. Thus, the region, in the wake of peace, presents a huge potential for growth.

### In The Rural Western Region

Increases in proportion of members employed, assets (amount of farmland operated and value of livestock owned), and population pressure at the community level had positive impacts on real per capita consumption expenditure. For example, a one acre increase in farmland was associated with an increase of about USh 485 per capita real consumption. Using the average household size of 6 persons, this translates into an

annual real consumption expenditure of about USh 7270 per household. Together, the above results suggest that adopting policies and strategies that creates employment opportunities, improves access to farmland and supports animal husbandry will be key interventions for raising consumption in the rural central region.

### ***Determinants of Change in Head-Count Poverty Index***

**Table 4** shows probit results of the factors contributing to the probability of the household's movement out of poverty vis-à-vis staying in poverty, conditioned on their probability of being poor in 1992/93. **Table 4** also shows results of the factors contributing to the probability of the household's movement into poverty vis-à-vis staying out of poverty, conditioned on the their probability of being not poor in 1992/93. The first-stage probit results of the factors contributing to the probability of the household being poor or not in 1992/93 are shown in **Annex 2**.

#### Poor or Not Poor in 1992/93

Almost all of the signs associated with the factors that had a statistical significant impact on the probability of the household being poor or not in 1992/93 conform to our expectations. For example, households with greater number of people as well as those with more older people and dependents were more likely to be poor in 1992/93. On the other hand, households with greater number of educated members, greater livestock assets, or located in areas with better access to infrastructure were less likely to be poor. Seemingly contradictory, female-headed households were more likely to be poor, while households with greater proportion of females were less likely to be poor. Households located in the central region were less likely to be poor, compared to their counterparts located in the other regions. Comparing the three other regions, statistical test results show that households located in the western region were the least likely to be poor. Other factors remaining the same, households located in the eastern and northern regions were equally likely to be poor.



**Table 4. Second-Stage Probit Regression Results (Marginal Effects) of The Determinants of Change Between 1992/93 and 1999/00 in Household Poverty (P0) in Uganda<sup>1</sup>**

Variable description <sup>2</sup>	Moved out of Poverty	Moved into Poverty
<b>Change in Household Level Characteristics</b>		
Change in gender of head (cf.: no change)		
Male to female	0.06988	0.03165
Female to male	0.03157	0.05181
Change in age of head (years)	-0.00349	0.00060
Change in proportion female members (%)	0.00051	-0.00044
Change in number of members	-0.00585	0.01797 *
Change in proportion of members aged (%):		
0 to 4 years old	-0.00272 *	0.00124
5 to 10 years old	-0.00383 ***	0.00158
11 to 17 years old	-0.00191 *	0.00286 *
65 years old and above	0.00198 *	-0.00001
Change in proportion of members with (%):		
Primary education	-0.00023	0.00026
Greater than primary education	0.00022	-0.00066
Change in number of extension visits received	0.01069	0.00801
Number of members sick more than 1 month in 1992 to 2000	-0.00207	0.00590
Change in proportion of members employed (%)	-0.00112	0.00089
Change in proportion employed in non-agriculture sector (%)	0.00081	0.00031
Change amount of agricultural land operated (ha)	-0.00422	-0.01537
Change in real value of livestock owned (in 1992/93 '000 USh)	0.00011	-0.00012
Change in real value of agricultural equipment owned (in 1992/93 '000 USh)	-0.00020	-0.00042
<b>Change in Community Level Characteristics</b>		
Change in index of ethnic heterogeneity (%)	-0.00174	0.00666 *
Change in access to economic infrastructure	0.05053 *	0.00337
Change in population density (persons per square kilometer)	0.00021	0.00226 ***
Number of years of drought incidence between 1992 and 2000	-0.02874	0.04753 **
Number of observations	533	407
F-statistic	1.75 **	1.33 *
Observed positive outcome (%)	38	11
Predicted probability of positive outcome (%)	41	23

Notes:

<sup>1</sup> See Annex 2 for first-stage results. Coefficients and underlying standard errors are adjusted for weighting of sample; \*, \*\* and \*\*\* means marginal effect or test statistic is statistically significant at the 10%, 5% and 1% level, respectively.

<sup>2</sup> See Table 1 for notes on the explanatory variables.

Sources of data: 1992/93 Uganda National Integrated Household Survey (GOU 1993) and 1999/00 Uganda National Household Survey (UBOS 2001).

The results also show that households located in more densely-populated communities or in communities that experienced a drought were less likely to be poor. These are surprising since the panel data also show that densely-populated communities and communities that experienced a drought tended to be located more in the rural eastern region, which recorded the largest poverty rates. However, since regional location is controlled for in the analysis, the reasons for these impacts are not clear.

#### Movement Out of Poverty and Movement Into Poverty

For those households that were poor in 1992/93, reduction in dependency (i.e. proportion of household members less than 18 years of age) and improvement in access to infrastructure were the main factors contributing to their movement out of poverty. These results are consistent with our earlier findings that increase in household size and dependents and improvement in access to infrastructure were respectively associated with decrease and increase in real per capita consumption in most of the regions.

Regarding households that were not poor in 1992/93, increase in population pressure at the household level (i.e. household size and teenage dependents) and at the community level as well as increase in the incidence of drought were the main factors contributing to their movement into poverty. These results are also consistent with our earlier findings, especially those for the rural eastern region, which contributed most of the movement into poverty.

## V. CONCLUSIONS AND IMPLICATIONS

Uganda has been undergoing a major transformation since the late 1980s towards economic growth and poverty reduction. However, recent estimates showing increase in the incidence of poverty suggest that recent growth has not been pro poor, threatening the government's poverty eradication plan of reducing poverty to a level below 28% by 2014. Understanding the causal factors of changes in household-level poverty is thus important. This paper helps to fill this knowledge gap by examining the factors that have contributed to change in household-level poverty (measured by change in per capita real monthly consumption expenditure and change in head-count poverty index (P0)) in Uganda between 1992/93 and 1999/00 using a panel data set from National Household Surveys conducted in those two periods.

On average, per capita real consumption increased by about 49% from 1992/93 to 1999/00 (or 6.5% per annum), with the change being largest in urban areas, followed by the rural central region, rural western region and then rural eastern region. The change in the rural northern region was virtually zero. Looking at the head-count poverty index, on average, the population of households below the poverty line declined from 58% in 1992/93 to 32% in 1999/00. Of those who were poor in 1992/93, about 66% of them escaped poverty and, of those who not poor in 1992/93, 26% of them went into poverty. Households in the northern region fared worst, as 61% of those who were poor in 1992/93 were still poor in 1999/00.

Results from econometric analyses show that, in general, increase in household size had a negative impact on real per capita consumption, while increase in farmland assets or increase in the proportion of household members that were employed had positive impacts. In addition, increase in population pressure at the household level (i.e. household size and teenage dependents) and at the community level were the main factors contributing to movement of households into poverty. Together, these suggest that adopting policies and strategies that reduce the pressure on agricultural land, creates

employment opportunities, and improves access to farmland will be key interventions for raising real per capita consumption and reducing poverty across the country.

However, the results also show that the impact of several factors are not the same across the country, suggesting that different interventions for raising consumption will also be needed for different parts of the country. For example, improving access to and quality of infrastructure will be important in rural central and eastern regions while improving support to livestock husbandry will be important in the rural western region. Improvement in access to infrastructure also was a main factor contributing to movement of households out of poverty. In the urban areas, improving drought management techniques of those engaged in agriculture will be very important; rainfed agriculture was the main economic activity for about 40% of urban dwellers. Increase in the incidence of drought also was a main factor that contributed to movement of households into poverty.

The rural eastern and northern regions require further attention. In the former, rapid population growth (3.62% per annum), in addition to the already very dense population (226 persons per square kilometer), seem to be contributing to resource degradation, declining agricultural productivity, and increasing poverty. Thus, reducing the pressure on agricultural land and creating employment opportunities will be crucial in reversing the recent increase in poverty. With the insecurity problem in northern Uganda, it is unlikely for investment in infrastructure or provision of public services to prompt or support growth in any significant manner in the region, given that there is a threshold effect of security on growth (Zhang 2004). However, with a vast amount of farmland having been left uncultivated for nearly two decades, the region, in the wake of peace, presents a huge potential for growth.

# Annex 1. Description of Variables and Summary Statistics by Household Poverty in 1992/93 in Uganda<sup>1</sup>

Variable description	Total Sample	Poverty Status		Test
		Poor	Not Poor	
<b>Household Level Characteristics</b>				
Gender of head in 1992/93 (0=female; 1=male)	0.778	0.755	0.810	*
Age of head in 1992/93 (years)	43.096	45.398	39.874	***
Proportion female members in 1992/93 (%)	50.264	50.028	50.594	
Number of members in 1992/93	5.665	6.053	5.122	***
Proportion of members in 1992/93 aged (%) (cf.: 18–64 years old):				
0 to 4 years old	17.871	17.440	18.474	
5 to 10 years old	14.815	15.925	13.263	**
11 to 17 years old	16.576	18.592	13.755	***
65 years old and above	4.669	5.181	3.953	
Proportion of members with formal education in 1992/93 (%) (cf.: no education):				
Primary education	46.024	43.816	49.115	**
Greater than primary education	7.379	5.584	9.891	***
Number of extension visits received in 1992/93	0.145	0.137	0.156	
Number of members sick more than 1 month in 1992/93	0.036	0.028	0.048	
Proportion of members employed in 1992/93 (%)	45.167	43.392	47.651	**
Proportion employed in non-agriculture sector in 1992/93 (%)	13.643	9.732	19.115	***
Amount of agricultural land operated in 1992/93 (ha)	3.353	3.418	3.261	
Value of livestock owned in 1992/93 (‘000 USh) <sup>2,3</sup>	107.055	69.698	159.565	**
Value of agricultural equipment owned in 1992/93 (‘000 USh) <sup>2,3</sup>	10.353	10.203	10.564	
<b>Community Level Characteristics</b>				
Index of ethnic heterogeneity in 1992/93 (%) <sup>4</sup>	20.72	19.77	22.08	
Access to economic infrastructure in 1992/93 <sup>5</sup>	2.983	2.783	3.264	***
Population density in 1992/93 (persons per square kilometer) <sup>6</sup>	142.089	138.719	146.804	
Drought incidence in 1992/93 (0=no; 1=yes)	0.112	0.112	0.111	
Rural area (0=no; 1=yes)	0.963	0.972	0.950	**
Regional location (cf.: central region)				
Eastern Region	0.257	0.272	0.235	
Northern Region	0.188	0.228	0.132	***
Western Region	0.307	0.306	0.309	
Number of observations	940	533	407	

Notes:

<sup>1</sup> Means and standard errors are adjusted for weighting of sample; \*, \*\* and \*\*\* for the tests imply means are statistically significantly different from each other at the 10%, 5% and 1% level, respectively.

<sup>2</sup> US\$ 1≈US\$ 1227 in 1992/93 (UBOS 1999).

<sup>3</sup> Regarding value of livestock and equipment, the 1992/93 levels were based on recall using the 1999/00 for comparison: much more, more, about equal, less, much less, and none. Following Deininger (2003), we assign the following respective percentage changes to calculate the 1992/93 levels: –50%, –25%, 0%, 25%, 50%, and 100%.

<sup>4</sup> Heterogeneity of ethnicity is measured by a version of the Simpson index  $((1-\sum_k \delta_k^2)*100)$ ; where  $\delta$  is the proportion of  $k$ th ethnic group in total population in the community), with larger values of the index representing greater heterogeneity. Thus, change in heterogeneity is change in the index.

<sup>5</sup> Access to economic infrastructure is the sum of five binary variables representing presence of tarred road, murram road, bank, post office, or telephone booth within an hour's access.

<sup>6</sup> Population density is measured at the district level, as there was no information on the total area and population of the community (LC1 level) for the respective years.

Sources of data: 1992/93 Uganda National Integrated Household Survey (GOU 1993) and 1999/00 Uganda National Household Survey (UBOS 2001).

## Annex 2. First-Stage Probit Regression Results (Marginal Effects) of The Determinants of Household Poverty (P0) in 1992/93 in Uganda<sup>1</sup>

Variable description <sup>2</sup>	Poverty (0=not poor; 1=poor)
<b>Household Level Characteristics</b>	
Gender of head in 1992/93 (0=female; 1=male)	-0.12835 ***
Age of head in 1992/93 (years)	0.00571 ***
Proportion female members in 1992/93 (%)	-0.00275 ***
Number of members in 1992/93	0.02508 ***
Proportion of members in 1992/93 aged (%) (cf.: 18–64 years old):	
0 to 4 years old	0.00202
5 to 10 years old	0.00389 **
11 to 17 years old	0.00597 ***
65 years old and above	-0.00146
Proportion of members with formal education in 1992/93 (%) (cf.: no education):	
Primary education	-0.00346 ***
Greater than primary education	-0.00448 ***
Number of extension visits received in 1992/93	0.00078
Number of members sick more than 1 month in 1992/93	-0.06397
Proportion of members employed in 1992/93 (%)	0.00157
Proportion employed in non-agriculture sector in 1992/93 (%)	-0.00077
Amount of agricultural land operated in 1992/93 (ha)	0.00192
Value of livestock owned in 1992/93 ('000 USh) <sup>2,3</sup>	-0.00022 ***
Value of agricultural equipment owned in 1992/93 ('000 USh) <sup>2,3</sup>	-0.00003
<b>Community Level Characteristics</b>	
Index of ethnic heterogeneity in 1992/93 (%) <sup>4</sup>	0.00080
Access to economic infrastructure in 1992/93 <sup>5</sup>	-0.02489 **
Population density in 1992/93 (persons per square kilometer) <sup>6</sup>	-0.00100 ***
Drought incidence in 1992/93 (0=no; 1=yes)	-0.14104 *
Rural area (0=no; 1=yes)	-0.01765
Regional location (cf.: central region)	
Eastern Region	0.26699 ***
Northern Region	0.17751 ***
Western Region	0.10825 *
Number of observations	940
F-statistic	5.01 ***
Observed positive outcome (%)	58
Predicted probability of positive outcome (%)	60
<b>Statistical tests of equality of coefficients of regional location (F– statistics)</b>	
Ho: Eastern Region=Northern Region=Western Region	4.32 ***
Ho: Eastern Region=Northern Region	1.58
Ho: Eastern Region=Western Region	8.20 ***
Ho: Northern Region=Western Region	1.45

Notes:

<sup>1</sup> See Table 4 for second-stage results. Coefficients and underlying standard errors are adjusted for weighting of sample; \*, \*\* and \*\*\* means marginal effect or test statistic is statistically significant at the 10%, 5% and 1% level, respectively.

<sup>2</sup> See Annex 1 for notes on the explanatory variables.

Source of data: 1992/93 Uganda National Integrated Household Survey (GOU 1993)

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